EXPERIMENTS IN FLUSHING THE INTESTINAL CANAL WITH SALT SOLUTION THROUGH MULTIPLE ENTEROTOMY OPENINGS.*

A SERIES OF STUDIES ON ANIMALS AND ON HUMAN CADAVERS FOR THE PURPOSE OF DETERMINING WHETHER IT IS PRACTICABLE TO ATTEMPT TO REMOVE A PART, OR THE WHOLE, OF THE INTESTINAL CONTENTS BY WASHING OUT THE CANAL OF THE SMALL INTESTINE THROUGH ENTEROTOMY OPENINGS, SYSTEMATICALLY FROM ABOVE DOWNWARDS; AND, FINALLY, BY WASHING OUT THE COLON FROM THE LOWEST ENTEROTOMY OPENING, THE CONTENTS OF THE COLON AND WASH WATER ESCAPING FROM THE ANUS.

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FOR a number of years I have been much interested in what has seemed to me a useful procedure in certain conditions of the intestines; namely, the immediate removal of an appreciable portion of intestinal contents through one or more enterotomy openings. In an article read before this Association in 1903[1] I suggested the possibility of emptying the intestines through a rigid tube upon which a considerable length of the intestines is *gathered*. Later I made further experiments upon the cadaver in reference to this procedure, and published them.[2] In many cases, as has been shown by my own experience, and that of a number of other surgeons who have kindly communicated their results to me, this procedure is quite sufficient to relieve the intestines by removing a large part of their contents.

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* Read before the American Surgical Association, May 6, 1908.

[1] Intestinal Localization. ANNALS OF SURGERY, October, 1903, p. 575.

[2] Studies in the Surgical Anatomy of the Small Intestine and its Mesentery. ANNALS OF SURGERY, October, 1905, p. 543.

NOTE.—These experiments were performed at the Harvard Medical School: the animal experiments in the Laboratory of Physiology, and the Laboratory of the Division of Surgery; the experiments on cadavers in the rooms belonging to the Department of Operative Surgery.

I was not aware that this procedure had ever been used by any one else until just before I presented my paper at the meeting. At that

I have long had the feeling, however, that, in certain critical cases of acute intestinal toxæmia in which the patient's life is threatened because of it, something more may be needed. It has also seemed to me that if a method could be devised by which the intestinal canal, or even a portion of it, could be cleansed by washing with warm salt solution without causing thereby fatal shock or peritonitis, a useful procedure might result—a procedure which would accord with a correct surgical principle, viz., the immediate and thorough removal of at least one of the principal causes of the patient's illness.

Now, while a straight canal, if not too long, can easily be flushed from one end to the other by a steady flow of salt solution, such a procedure in a tortuous canal like the human intestine is practically impossible. Even if this could be done, the force required to do it, and the resulting tension

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time Dr. John E. Summers, Jr., of Omaha, called my attention to an article on "Intestinal Paralysis" by Dr. George Haslam, of Fremont, Nebraska, in which article irrigation of the intestinal canal was used in several cases. The reprint of this article, which Dr. Summers kindly gave me, does not state where the article originally appeared, but a footnote says that it is "Part of paper read at the annual meeting of the Dodge County Medical Society held at Fremont, Nebraska, December 11, 1902." In some of these cases permanent openings were made and the bowel was flushed from time to time after operation; in others the intestinal wounds were sewed up and the bowel returned to the abdominal cavity. One case given at length deserves special mention. The patient was a boy, of 14 years, who was "suffering from a severe attack of intestinal paralysis accompanying a relapsing appendicitis." A loop of small intestine, about 18 inches long, and "as high as possible" was drawn through an abdominal incision. Each end of the loop was opened and the bowel washed out. The "openings were stitched to the extreme end of the incision, the intermediate portion of which was then closed with deep stitches." The stomata were used to flush out the bowels during the first few days after operation. Later the openings were closed, and the bowel replaced in the abdomen. The patient made a good recovery. Dr. Haslam recommends in such cases enterostomy openings "as high as possible" with a good length of bowel between them. He refers to an article by Dr. Edmund M. Pond of Rutland, Vt. (*American Journ. Obstet.*, 1898, p. 289). Dr. Pond's patient was a girl of 10 years, suffering with appendicitis and general suppurative peritonitis. From the description given it is evident that the patient was in a desperate condition. The abdominal cavity was thoroughly irrigated, and a distended loop of within the intestine would be so great as probably to cause injury to the wall or attachments of the gut, or even a rupture.

While thinking over this subject it occurred to me that it might be worth while in the experiments which I purposed to make, to determine, so far as I could, whether the intestinal canal could be cleansed with comparative ease and safety, not by attempting to flush the whole bowel at once, but by flushing it section by section. It also seemed obvious to me that, to flush the intestinal canal properly, the flushing should be carried out from above downwards, or, in other words, that the irrigating fluid should be introduced into the intestinal canal through an enterotomy wound high up in the gut, and that after traversing the section of gut just below, it should be allowed to escape from a second enterotomy wound at the lower end of that section, and that later the second section of bowel should be flushed in the same way, that is, from above

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small intestine, a few feet from the ileocæcal valve, was brought into the wound, stitched to it and incised. Hot saline solution was then introduced into the bowel above and below the incision, and the bowel "thoroughly unloaded." From time to time during the next few days the bowels were irrigated through the fistula. The patient ultimately recovered. Dr. Pond was, apparently, the first surgeon to make use of irrigation of any kind for the purpose of cleansing the bowels.

Had I known of these cases earlier I should have been glad to incorporate them in my paper. As it is, however, I am obliged to place them in a footnote. It is gratifying to learn of the success which attended irrigation of the bowel in these cases of Drs. Haslam and Pond.

From the accounts given of these cases, however, I do not understand that any attempt was made to wash from above downwards, or to cleanse systematically the whole of the small intestine, or even a large part of it, and furthermore no mention whatever is made of cleansing the colon.

After my paper had been read at the meeting my attention was called to the following statement in Keen's Surgery, vol. iii, p. 777: "Kocher opens high in the jejunum and low in the ileum, washing the gut through and through and closing the openings at the termination of the irrigation." I have not been able, however, to find the original article, in which Kocher describes this procedure. I also fail to understand how the human intestine can be flushed from one opening high in the jejunum to another low in the ileum without causing very dangerous pressure within the gut. In a number of experiments on the cadaver I found this procedure practically impossible.

downwards. A glance at Fig. 1 will make clear this division of the small intestine into sections; the first section being between the first and second enterotomy wounds, and the second section between the second and third. This diagram is intended only to illustrate the principle on which flushing may be done. The number and position of the enterotomy wounds would naturally vary with the case.*

Now, in the human cadaver in order to cause the irrigating fluid to flow downwards in the bowel—and not upwards—it is necessary for the surgeon first to determine with certainty the *real direction* of the bowel in any loop of gut which he proposes to incise. This can be determined with certainty, provided the abdominal wound is large enough to allow palpation of the mesenteric root. For the purpose of explaining this method in detail I take the liberty of introducing Fig. 2, which has already appeared in one of the articles already referred to. A loop of intestine is gently drawn out of the wound by the surgeon. The assistant, grasping the two ends of this loop, holds it suspended vertically from the wound. The surgeon, putting his thumb on one side of the loop and his fingers on the other, causes them gently to proceed down the mesentery towards the right side of the spine,—in other words, towards the root of the mesentery. Fig. 3 shows the narrow pathway in the deeper part of the mesentery down which his thumb and fingers must proceed in order to reach the mesenteric root. If he finds a twist in the mesentery—a condition easy to detect —he withdraws his hand, and turns the loop of bowel in such a way that the twist is removed. His thumb and fingers are then pushed again down the mesentery, in the same manner as before, towards the mesenteric root. If there is then no twist in the mesentery the surgeon knows that the proximal end of

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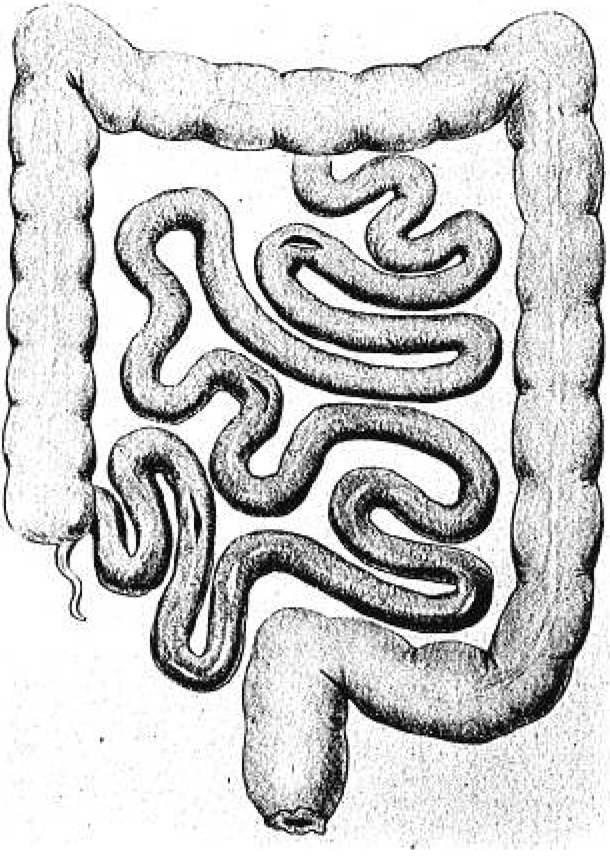
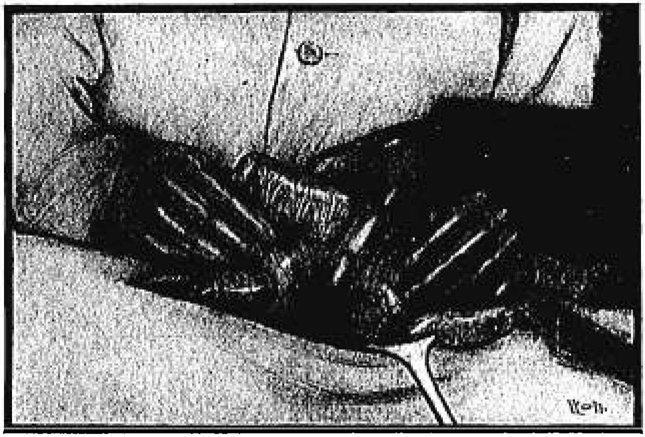
* The systematic irrigation of the intestinal canal here suggested was planned for the purpose of experiments on cadavers and on animals, in which no pathological obstruction was supposed to exist. It is, of course, obvious that no attempt should be made on a patient with mechanical obstruction to irrigate that part of the bowel in which obstruction exists, or, to do so even after the obstruction has been removed, if there is reason to believe that the wall of the gut has been weakened.

FIG I.



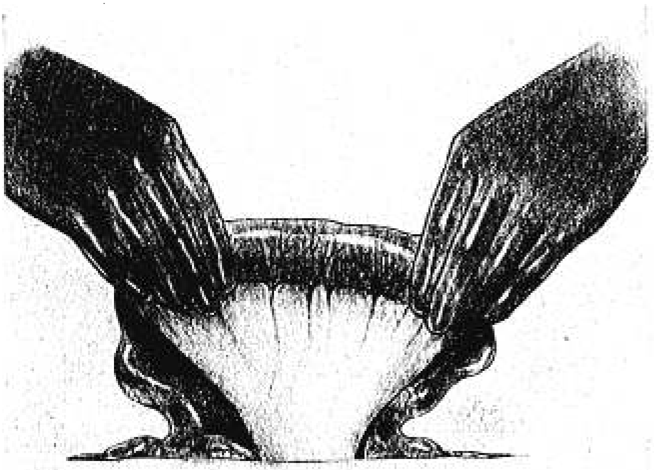
A diagram to illustrate a method by which the intestinal canal may be flushed. In this diagram three enterotomy wounds are shown. The number and position of the enterotomy wounds would naturally vary with the case.

FIG. 2



Showing on the cadaver the method of determining the real direction of the gut by passing the thumb down one side of the mesentery, and the fore and middle fingers down the other, in the direction of the mesenteric root. If the whole of the cadaver were shown, its head would be on the left side of the illustration.

FIG. 3.



The loop of bowel is being held upwards by the assistant. The thumb and fingers would in this case proceed to the root of the mesentery down the constricted pathway in the middle probably without encountering any twist.

the loop lies at the upper end of the wound, and the distal end of the loop at the lower end of the wound. In this simple manner he learns what is the real direction of the gut, and, therefore, the direction in which the irrigating nozzle should be placed in the bowel. Simple as it is, however, it is hardly likely that one can successfully carry out this procedure on the living subject until one has tried it—in fact, practised it—on the cadaver.

With the idea of testing, so far as I could, the practicability of flushing the canal of the bowel, section by section, I carried out during the last two years at the Harvard Medical School a series of experiments on animals and human cadavers. In all of them I was assisted by Dr. William E. Faulkner, and it gives me pleasure here to acknowledge his kind and helpful services. I beg to thank also Professors W. T. Porter and W. B. Cannon for having placed at my disposal for a part of the animal experiments the necessary laboratory facilities.

STUDIES ON ANIMALS.[3]

I carried out the procedure referred to on fifteen cats. Although the technic of the operations on these animals varied somewhat, the essential features were approximately the same in all. The anæsthetic used was ether.

The hair upon the abdomen was removed by a depilator, and the skin cleansed and sterilized. The abdomen, having been freely laid open and the coils of intestine brought outside of the abdominal wound, the gut was incised on its free border at a point near the upper end of the jejunum. A small glass tube was then introduced through the enterotomy wound, and this tube, having been pushed well into the lower arm of the gut, was held or tied in position, after which the gut below the opening was gently filled with warm salt solution to a point just above the ileocæcal valve. At this point there was made another opening in the gut, and much of the salt solution which had already been injected into the gut through the upper opening was allowed, mixed as it was with intestinal contents, to escape through the lower one. More salt solution was then introduced through the upper opening, and, of course, more wash water, mixed with intestinal contents, escaped from the lower opening, or through a glass tube which had been previously inserted into it. About one pint of salt solution was thus passed through the gut, the reservoir being held from 1 to 3 feet above the body of the animal. The length of intestine between these two openings was 3 to 5 feet, according to the length of the animal's bowel. The upper intestinal wound was then sewed up, and carefully cleansed, and all of the bowel which had been flushed, except that part in which the lower intestinal wound was situated, was returned to the abdominal cavity. In a few cases the lower intestinal wound was then sewed up, and the loop of bowel cleansed and returned to the abdomen. In the other cases—the most recent ones—the colon also was flushed from the lower intestinal wound through to the anus. This was accomplished by inserting the glass tube, directed downwards, into the lower enterotomy opening, and allowing warm salt solution gradually to flow into and distend the colon. After this an exit tube was inserted into the anus, and the bottle held a little higher. The result was that the wash water, mixed with fecal material, finally ran out through the anal tube. This washing was continued until the salt solution came away clear. The second enterotomy wound was then sewed up and the abdomen closed without drainage. Naturally, much of the fluid which had been injected into the bowels still remained there.

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[3] My reason for beginning these experiments on animals rather than on human cadavers was principally because of the fact that the intestinal canal is much simpler and shorter in cats (the animals which I purposed to use) than in human beings, and I wished first to try the effect of this procedure (flushing the intestinal canal) under conditions which seemed most favorable before proceeding with what I knew would be (mechanically, at least) more difficult, namely, flushing the intestines of human cadavers. In connection with these experiments on cats I had also, of course, the great incidental advantage of observing the immediate and remote effects of the operation on living animals.

It is hardly necessary to say that in all of these cases the greatest care was taken to avoid contamination of the peritoneum by the intestinal contents. During the manipulations those parts of the bowel in which were situated the enterotomy openings were drawn well towards the operator, and from the time when the first incision was made until the suturing was complete they were kept carefully isolated from the other parts, partly by gauze, but in the latter cases by means of superimposed sheets of rubber dam.

This method of using rubber dam proved so useful to me in these experiments that I give it here in detail. It seems to me not unlikely that it may be of practical value during operations on the human subject; in fact I have myself used it, with advantage, in a number of abdominal operations.

A piece of thin sheet rubber about one foot square,—on the human subject it should be 18 inches square,—properly sterilized, and moistened, with a small slit made at or near its centre, was laid over the laparotomy sheet in such position as to bring the slit in the rubber dam directly over the abdominal wound. The small intestines were then gently lifted out through the abdominal wound, and made to rest upon the rubber dam. Another sheet of rubber dam, also sterilized and moist, was then laid over them. Two little slits were then cut in this second rubber dam, and through them were gently drawn the two loops of intestine—naturally one belonged to the upper part of the gut and the other to its lower part—in which were to be made the two enterotomy openings. Though most of the intestinal coils were outside of the abdominal cavity, nevertheless, they lay between two sheets of rubber dam where they were kept moist and warm, and protected from injury and infection.

Of the fifteen cats operated on five died and ten lived. *Cat No. 1* died four weeks after the operation, but no definite cause for death could be found at the autopsy. The wounds in the intestine were solidly healed and there was no sign of peritonitis. *Cat No. 4* died eleven days after the operation. At the autopsy the upper wound in the intestines was found firmly healed. The lower wound, however, was in the middle of a large suppurating area (*peritonitis*) in which several coils of intestine were included. The stitches in the enterotomy wound had evidently given way, for the wound was open, thus permitting the escape of intestinal contents into the peritoneal cavity. *Cat No. 6* died three weeks and one day after the operation. The autopsy showed that the cause of death was *peritonitis,* and both wounds were open. It is likely that the peritonitis was due largely, if not wholly, to the fact that, intentionally, no attempt had been made in this case to approximate the serous surfaces of the bowel, the intestinal wounds having been united by a simple over-and-over suture. The method was used here for the reason that it had been successfully tried in the preceding case. The two other fatal cases were *Cats No. 10* and *No. 12.* Both of these animals died during operation—presumably from ether. Of the five cats, then, which died, the cause of death in two was presumably etherization; in one it was not discovered, while in the other two it was peritonitis resulting probably from technical errors, which had no necessary connection with the principle under investigation. None of the three cats which survived the operation was at any time after it in good condition. All three were evidently very sick, and from the time of the operation they took little or nothing in the way of food.

On the other hand, the ten cats which survived seemed to regain their former condition of health and activity within one to three days after operation, and they ate their usual amount of food.

Autopsies were done on these ten cats at the following times after operation: at 6 days (2 cats); at 8 days (1 cat); at 13 days (1 cat); at 18 days (1 cat); at 21 days (1 cat); at 26 days (1 cat); at 32 days (1 cat); at 33 days (1 cat); and at 35 days (1 cat). The animals were killed by etherization or by the use of gas, before these examinations were made.

Barring the fact that in a few cases the abdominal wound did not heal by first intention throughout, nothing pathological was discovered at any of these autopsies, and the condition of the abdominal contents was quite normal except for the presence of the firmly healed intestinal wounds, and a few adhesions. The intestinal sutures (iron-dyed silk), partly disintegrated, were in some of the cases in the process of being thrown off from the wounds into the lumen of the gut.

From these experiments one is, I think, justified in stating (1) that it is mechanically possible, from an abdominal wound in a cat, to flush with salt solution the greater part of the small intestine through an opening in the upper part of the jejunum, to a second opening in the lower part of the ileum, and then to flush the large intestine from this second opening, the intestinal contents and wash water escaping through a tube previously inserted through the anus into the rectum; (2) that it is possible to do this in the majority of cases, if not in all of them, without causing sufficient shock to kill the animal; (3) that it is possible to do this without peritonitis resulting, provided, of course, that the operative technic is without error; (4) and, that it is probable the animal will regain, in the usual time after an abdominal operation, its former condition of health and activity.

STUDIES ON CADAVERS.

I next tried to flush the intestinal canal of human cadavers with the same technic I had used in the cats, but I soon found, as I had expected, that the problem in the human body is a much more complicated one. While in a cat the small intestine is short, of small calibre, thick-walled, and comparatively simple in the disposition of its coils, that of the human being is very long, of large calibre, thin-walled, and very complicated in its arrangement.

With the abdomen of the cadaver wide open I attempted to flush the intestines, by sections, from the upper part of the jejunum down. On the whole, this attempt was successful, though I found that, in order to do it satisfactorily, more openings in the intestine were required than were necessary in the animal experiments. The great length of the intestine, the complicated arrangement of its coils, and the occasional presence of masses of solid or semisolid feces in the colon presented obstacles to the onward flow of the water, though a gentle manipulation of the distended coils usually sufficed to remove the obstruction, and to allow the fluid to proceed down the intestinal canal. The technic was essentially as follows:

The abdomen having been freely laid open from ensiform cartilage to pubes, the presenting intestinal loops were lifted out of the abdominal cavity, and an incision was made into the jejunum as high up as possible. A large glass tube was tied into the opening thus made, and water, gradually introduced through the tube, was allowed fully to distend as much of the intestine below the opening as possible. After this the intestine was opened lower down and another tube—this one for exit—was tied in place. The portion of intestine to be cleaned was isolated from the rest of the bowel either by clamps, or by the ligatures used for holding the tube in place, or by hand pressure. The fluid which entered the intestine through the upper tube, coursed down the intestinal canal, and came out through the lower tube, carrying with it most of the intestinal contents. When the wash water was clear, the upper tube was removed, and the intestinal wound sewed up. The second segment of intestine was then flushed in the same way as the first one, the exit tube for the first segment of bowel being replaced, and used for the *flushing tube* of the second.

This process of irrigating the small intestine, section by section, and sewing up the enterotomy wounds when they were no longer needed, was continued until nearly the whole of the small intestine had been flushed, and its contents largely removed. It was necessary to make at least three openings in the gut—sometimes four or five—in order to wash out the gut in its whole length. From the lowest enterotomy opening the attempt was then made to flush the rest of the small intestine and the colon. As a rule this was successful, though, as I have already said, the presence in the colon of solid or semisolid feces sometimes made this process difficult. Finally the last enterotomy opening was sewed up, and the abdomen closed.

In order to determine whether a change of posture would make any difference with the ease with which the intestines could be washed out, I tried several of these washing experiments, with the cadaver in different positions. While the distended loops of an inverted cadaver—the intestines hanging from the open abdominal wound—could be washed out rather more easily than those of a cadaver lying on its back, the difference was not especially marked. The other positions tried, viz.: elevated head, elevated feet, one side or the other uppermost, etc., showed no appreciable difference in the ease of flushing the bowel.

As a result of these, and many other similar experiments in flushing the intestinal canal of human cadavers I reached the following conclusions:

1. That it is possible in most cadavers to flush the entire intestinal canal, *by sections,* from the upper part of the jejunum through to the anus, provided that the abdomen is freely laid open from ensiform cartilage to pubes, and also provided that, as already explained, there are made in the intestine a sufficient number of openings.

2. That it is possible in most cadavers, through an incision from umbilicus to pubes, to flush either the lower part of the small intestine only, or the lower part of the small intestine, and the colon in addition.

After I had conducted a number of these experiments on animals and cadavers it seemed to me that gently to flush the intestinal canal of a patient suffering with acute intestinal toxæmia, was a practicable procedure, and that, after the simpler methods had been used without result, it was a thoroughly justifiable one. It also seemed obvious that, after the escape of intestinal contents which would naturally take place through the enterotomy wounds—especially when a long evacuating tube is used,—a careful washing of the intestinal canal with warm salt solution would be of great advantage to such a patient, especially for the following reasons: first, because it would cleanse a region which was the source of poisonous infection; secondly, because it would leave within the intestinal canal a large quantity of salt solution where it would be absorbed into the circulation, and thus improve the pulse; thirdly, because the warmth of the solution left in the bowel would probably help to resist shock. For these reasons I felt willing to carry out this procedure on a patient, provided the conditions which the patient presented seemed to me to justify it.

CASE.

Finally a case, for which the treatment outlined above, or some modification of it, seemed especially suitable, entered my service at the Boston City Hospital. This case has already been published in full,[4] but as some reference to it seems to be called for in connection with the experiments which led up to it, I give here a brief abstract.

The patient was a little girl eight years old, whose condition (the result of streptococcus peritonitis and probably also intestinal toxæmia) was deplorable. The case was one of a class that surgeons dread to see. She presented the symptoms of an extreme degree of septicæmia, or toxæmia, and a fatal result within a few hours seemed inevitable. A median incision from umbilicus to pubes opened the abdominal cavity. There was free pus everywhere, and to the reddened intestines many thick yellowish flakes of fibrin were adherent. Exploration showed no obvious cause of peritonitis, though, as the appendix was somewhat swollen and injected, it was removed. The peritoneal cavity was thoroughly irrigated through a glass tube. A loop of intestine near the upper end of the wound[5] was drawn out and the real direction of the intestine comprising it determined.

An incision was then made in this loop, and a long glass tube, with its tip directed downwards, was introduced into the bowel through the intestinal wound. During this process much gas and a small amount of intestinal contents were removed. A gauze pad held by the hand firmly around the intestine kept the tube in place and prevented leakage. Warm salt solution was then allowed gradually to flow into and distend the intestinal canal, and a second enterotomy opening was made in the lowest intestinal loop which presented in the wound. Much foul-smelling gas and intestinal contents escaped from this second opening, but finally the wash water came out clear. The upper wound was then stitched up, and the tube was inserted into the lower wound, with its tip directed downwards. A large amount of salt solution was introduced which fully distended the rest of the small intestine and colon, and the lower wound was then stitched up. The peritoneal cavity was again irrigated, a small drain placed in the pelvis, and the abdomen closed. The greatest care was taken during the operation to avoid contamination of the peritoneum. After the dressing had been placed on the wound a rectal tube was introduced, and nearly a quart and a half of fluid, containing much fecal material, removed through it.

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[4] Boston Medical and Surgical Journal, June 20, 1907, p. 809.

[5] By an oversight in the original report of this case the impression was given that this loop was near the duodenum, whereas it was, in truth, probably in the lower half of the intestine.

The change in the patient's pulse during the operation was so marked as to call for special mention. While before the operation it was "thready" and registered 180 beats to the minute, it became much stronger during the flushing of the intestine and dropped to 140. The patient's general condition was correspondingly improved. On being put back to bed, she soon rallied from the effects of the operation, and finally got well.

REMARKS.

As a result of the experiments described, and also because of the recovery of the patient in the case just referred to, I am strongly inclined to the belief that the procedure has in certain cases, a distinct sphere of usefulness.

It seems to me that when a patient's life is in danger because of acute intestinal poisoning, associated with great distention of the bowels, and the time has passed when the ordinary methods seem likely to be of use, when the temperature is high and the pulse rapid and weak, there is in such a case a fair possibility that the immediate removal through enterotomy openings of a part of the intestinal contents, and flushing the gut with a quantity of warm salt solution, from one opening to another, may, at this critical period in his illness, turn the scale in favor of the patient, and thus save his life. I have suggested carrying out this procedure through multiple openings in the intestine for the reason that, in my opinion, it can be done more thoroughly in this manner. It is, of course, possible that even if done through only one opening the procedure may still be sufficient to be of material assistance to the patient. Apparently, the coexistence of peritonitis does not contraindicate the procedure.

It is quite possible that for various reasons the technic of this procedure is easier in a child than in an adult. However, I see no reason to prevent its performance in the adult, at least in part, provided great care is taken. Care must also be taken, as already mentioned, in cases in which there is, or has been, a mechanical obstruction of the bowel, or in which for any cause its walls are greatly weakened.

As for the technic of the procedure of flushing the intestinal canal I venture to make the following suggestions:

1. Make a free opening through the abdominal wall in the median line, the incision reaching from the pubes to, or above, the umbilicus.
2. Pick up a loop of bowel high up in the wound.
3. Determine by reference to the root of the mesentery which is really the upper and which the lower end of this loop. This determination is essential, if one wishes to know in which direction the salt solution will flow during the process of flushing.
4. Make an enterotomy wound in the loop. Allow gas and feces to escape, and insert the tube into that arm of the loop which leads in the direction of the ileocæcal valve: in other words insert the tube pointed downwards into the gut.
5. Allow warm salt solution gradually to distend a few of the loops below this opening. If nothing more than this is done in the way of washing, it seems to me that the substitution in the bowel of the warm salt solution in place of the gas and feces that have escaped, will presumably help the patient.
6. If the patient's condition will allow it, pick up the

loop which is apparently the lowest of those distended, make a second opening, insert a second tube—this one directed upwards—and allow the wash water to run out through the tube until it becomes clear.

7. Carefully cleanse and sew up the first enterotomy wound, and return to the abdomen that part of the bowel which has been washed out. In fact, as soon as any enterotomy wound is no longer needed it should be cleansed, and sewed up, and the loop of bowel which has been sutured should be returned to the abdominal cavity.

8. Repeat this procedure as many times, consistent with safety, as may seem necessary, each time isolating and cleansing a segment of intestine lower down.

9. Finally, if the patient's condition will permit further operating, fill the colon with salt solution from the lowest enterotomy opening, and insert a rectal tube to remove any wash water or intestinal contents which may reach the rectum. It is well to insert the rectal tube before attempting to close the abdominal wound, and thus make it easier, by removing some of the wash water in the colon, and diminishing its size, to bring together the edges of the wound.

10. Use great gentleness in all manipulations, and carefully avoid contamination of the peritoneum. The method already described of protecting the intestines between two layers of rubber dam bids fair to be of real service.

11. In the event that peritonitis is also present, the peritoneal cavity should be washed out thoroughly, *before* flushing the intestinal canal, and also *after* it.

In closing, I wish to repeat that I do not consider flushing the intestinal canal to be a substitute, in all cases, for tubage of the intestine, or even for ordinary enterostomy. Flushing would seem to be called for only in the most desperate cases—fortunately occurring less frequently, as time goes on—in which the bowels are greatly distended, and in which the patient, overwhelmed as he is with septic or toxic products, will die unless immediate relief is afforded.